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Mathematics: Calculus Lab Proposal

The College at Brockport, College Senate

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SUNY BROCKPORT

College Senate
State University of New York College at Brockport
350 New Campus Drive
Brockport, NY 14420-2925
(585) 395-2586 (Fax) 395-2246

Resolution # 30 2005-2006 COLLEGE SENATE

TO: Dr. John R. Halstead, College President

FROM: The College Senate passed: May 1, 2006

RE: ⇨ I. Formal Resolution (*Act of Determination*)
II. Recommendation (*Urging the Fitness of*)
III. Other, For Your Information (*Notice, Request, Report, etc.*)

SUBJ: **Mathematics: Calculus Lab Proposal** #37 05-06 UC

Signed: 
(Dr. Mark Noll, 2005-2006 College Senate President)

Date: 5/4/06

Please fill out the bottom portion and return document to the College Senate Office.

TO: The College Senate

FROM: College President

RE: ⇨ I. Decision and Action Taken on Formal Resolution (circle)

a. Accepted. Resolution Effective Date: 8/4/07

b. Deferred for discussion with the Faculty Senate on ____/____/____

c. Unacceptable for the reasons contained in the attached explanation

II, III. Response to Recommendation or Other/FYI

a. Received and acknowledged ____/____/____

b. Comment: _____

DISTRIBUTED BY PRESIDENT'S OFFICE TO: Cabinet Members

DISTRIBUTE ALSO TO: Originator, Academic Advisement, Registrar (as appropriate)

Signed: 
(Dr. John R. Halstead, College President, SUNY College at Brockport)

Date: 12/13/06

**COLLEGE SENATE OFFICE
RESOLUTION PROPOSAL COVER
PAGE**

Routing Number	#37 05-06 UC
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ROUTING NUMBER TO BE ASSIGNED BY SENATE OFFICE

DEADLINE FOR SUBMISSIONS OF COMPLET PROPOSALS: FEBRUARY 23

Proposals received after the deadline may not be reviewed until next semester.

INSTRUCTIONS:

- Submit proposals individually rather than packets with multiple documents.
- Complete this cover page for each proposal (available online at www.brockport.edu/collegesenate)
- Prepare proposal in Word format using committee guidelines (available online)
- Submit proposal electronically with this cover page to senate@brockport.edu, facprez@brockport.edu
- All updates must be resubmitted to the Senate office with an updated cover page, use routing number
- Questions? Call the Senate office at 395-2586 or the appropriate committee chairperson.

1. PROPOSAL TITLE:

Please be somewhat descriptive, for example, *Graduate Probation/Dismissal Proposal* rather than *Graduate Proposal*.

1. Mathematics: Calculus Credit Hour Changes

2. BRIEF DESCRIPTION OF PROPOSAL:

Change in credit hours for each of the three calculus courses (MTH 201, 202, 203) from three credits to four credits

3. SUBMISSION & REVISION DATES: PLEASE DATE ALL UPDATED DOCUMENTS

First Submission	Updated on	Updated on	Updated on
Feb 21, 2006			

4. SUBMITTED BY: (contact person)

Name	Department	Phone	Email
Pierangela Veneziani	Mathematics	EXT 5485	pvenezia@brockport.edu

5. COMMITTEES TO COPY: (Senate office use only)

Standing Committee	Forwarded To	Date
<input type="checkbox"/> Enrollment Planning & Policies <input type="checkbox"/> Faculty & Professional Staff Policies <input type="checkbox"/> General Education & Curriculum Policies <input type="checkbox"/> Graduate Curriculum & Policies <input type="checkbox"/> Student Policies <input checked="" type="checkbox"/> XX Undergraduate Curriculum & Policies	Committee Chair	2/23/06
	Executive Committee	3/27/06
	Senate Floor	4/17/06 - vote 5/1/06
	College President	5/3/06
	Other	

*(ROUTING NUMBER WILL BE A CHRONOLOGICAL NUMBER SEQUENCE FOLLOWED BY COMMITTEE INITIALS)

The Department of Mathematics proposes

1. changes in the Mathematics Major:

- (a) change in credit hours for each of the three calculus courses (MTH 201, 202, 203) from three credits to four credits.

1. CHANGES IN THE MATHEMATICS MAJOR

COMPARISON BETWEEN OLD AND NEW PROGRAM

Students majoring in Mathematics will now have to complete a minimum of 42 credits in mathematics and four credits in computer science as illustrated below. This represents an additional three credits in the calculus sequence (MTH 201-203).

Existing Math Major	2. Credits	Proposed Math Major	Credits
	3.		
REQUIRED COURSES:	30	REQUIRED COURSES:	33
MTH 201,202,203 Calculus I-III	9	MTH 201, 202, 203 Calculus I-III	12
MTH 255 Differential Equations	3	MTH 255 Differential Equations	3
MTH 281 Discrete Math I	3	MTH 281 Discrete Math I	3
MTH 324 Linear Algebra	3	MTH 324 Linear Algebra	3
MTH 346/446 Prob & Stat I, II	6	MTH 346/446 Prob & Stat I, II	6
MTH 425 Modern Algebra	3	MTH 425 Modern Algebra	3
MTH 457 Real Analysis	3	MTH 457 Real Analysis	3
ELECTIVE COURSES:	9	ELECTIVE COURSES:	9
MTH electives at 400-level*	9	MTH electives at 400-level*	9
MAJOR COREQUISITE		MAJOR COREQUISITE	
CSC 203 Fund of Comp Science	4	CSC 203 Fund of Comp Science	4
TOTAL CREDITS	43	TOTAL CREDITS	46

*CSC 483 may be substituted for one of these MTH elective courses.

If a student comes in with 3-credit calculus courses, we will evaluate whether the material we cover was covered; if so the student will receive credit for the course. If a student has to make up 1 or 2 credits in order to reach the 46 credit to major in math, he/she will be able to make up the difference by taking an additional course or an independent study for the missing number of credits.

One possible sequence of mathematics courses in the proposed Mathematics Major is displayed in the following table:

	FALL SEMESTER	SPRING SEMESTER
Freshman	MTH 201 Calculus I	MTH 202 Calculus II MTH 281 Discrete Math I
Sophomore	MTH 203 Calculus III CSC 203 Fund of Comp Sci I	MTH 255 Differential Equations
Junior	MTH 324 Linear Algebra MTH 346 Probability & Statistics I	MTH 425 Modern Algebra MTH 446 Probability & Statistics II
Senior	MTH 457 Real Analysis MTH elective	MTH elective MTH elective

The number of credits required to complete a minor in Mathematics would increase accordingly. The number of courses required to complete a minor would not be affected.

4. MINOR IN MATHEMATICS

Existing minor	<i>5. Credits</i>	Proposed minor	Credits
MTH 201, 202 Calculus I, II	6	MTH 201, 202 Calculus I, II	8
MTH elective courses *	12	MTH elective courses *	12
Total number of credits	18	Total number of credits	20

*12 credits in mathematics, chosen from MTH 203, MTH 255, MTH 281 (or MTH 245), or courses numbered MTH 324 or above. Students should choose these electives after consultation with an advisor from their major department as well as with a mathematics faculty member. At least nine credits toward the minor must be completed at SUNY Brockport.

The number of credits required to complete a minor in Mathematics/Statistics would increase accordingly. The number of courses required to complete a minor would not be affected.

MINOR IN MATHEMATICS/STATISTICS
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Existing track A	6. Credits	Proposed track A	Credits
MTH 201,202,203 Calculus I-III	9	MTH 201,202,203 Calculus I-III	12
MTH 281 or MTH 245 Discrete Math I or Finite Math	3	MTH 281 or MTH 245 Discrete Math I or Finite Math	3
MTH 346,446 Prob & Stat I, II	6	MTH 346,446 Prob & Stat I, II	6
Total number of credits	18	Total number of credits	21
Existing track B	7. Credits	Proposed track B	Credits
MTH 201, 202 Calculus I, II	6	MTH 201, 202 Calculus I, II	8
MTH 281 or MTH 245 Discrete Math I or Finite Math	3	MTH 281 or MTH 245 Discrete Math I or Finite Math	3
MTH 346 Prob & Stat I	3	MTH 346 Prob & Stat I	3
MTH 441,442 Stat Methods I, II	6	MTH 441,442 Stat Methods I, II	6
Total number of credits	18	Total number of credits	20

COMPARISON WITH OTHER SUNY INSTITUTIONS

Statistics about the profile of mathematics majors in all SUNY schools granting a Bachelor of Science are provided in the table below.

Results can be summarized as follows.

1. All SUNY colleges, including those awarding only a BA in mathematics, offer a 12-credit calculus sequence.
2. The average minimum number of credits needed to major with a Bachelor of Science in Mathematics is 48.

BS granting Institutions	Minimum number of credits to complete a mathematics major	Additional requirements	Number of credits of Calculus sequence
8. Albany	42	Minor in atmospheric science, biology, business, chemistry, computer science, economics, electronics, geology, or physics.	12
Binghamton	45		12
Buffalo	51		12
Cortland	42		12
Fredonia	45 or 46		12
New Paltz	61		12
Old Westbury	48		12
Oswego	51-56 for BS in applied math		12
Plattsburgh	50		12
Stony Brook	45-49		12

BA (only) granting Institutions	Minimum number of credits to complete a mathematics major	Number of credits of Calculus sequence
Geneseo	41-43	12
Oneonta	36	12
Oswego	42-47	12
Potsdam	33	12
Purchase	44	12

RATIONALE FOR CHANGES IN THE CALCULUS SEQUENCE

The described changes in the mathematics major were strongly recommended by our external reviewers and envisioned by our faculty as a tool to serve *all* students well.

The main purpose of the change in the Calculus sequence is to allow for additional time to increase the students' understanding of mathematical concepts and their applications. The current 3-credit format for our calculus sequence does not allow for any in-depth analysis of mathematical concepts nor the presentation of real-life applications which would be very relevant to the majority of our Calculus students. An additional hour would allow us to incorporate in our Calculus courses a variety of activities, including additional lecture time, laboratory sessions, presentation of real-life applications in mathematics and other disciplines that require Calculus, group-work, and homework discussions.

We believe that including real-life applications and a variety of activities in service courses will better promote the idea of mathematics as a profession and of a major in mathematics as a marketable degree in a variety of fields. Our students are headed in many directions (K-12 teaching, industry, business, government, graduate school in mathematics and various other disciplines). Exposing students without a clear plan about their academic career to a variety of real-life applications may help them start making decisions about different tracks available in the last two years of their studies.

Finally, in a 2001 report by the Curriculum Foundations Project within the Mathematics Research Institute it is stressed how pipeline courses, like the Calculus sequence, can be used effectively to recruit and retain students by

1. Enriching courses with applications to show all students the meaning, history, and use of mathematics in society, an understanding often lacking even among mathematics majors.
 2. Employing a broad range of instructional techniques. Students need more classroom experience in which they learn to think, do, and analyze.
 3. Seeking out promising students and encouraging them to become mathematics majors or double majors.
-

COMPARISON WITH MODEL PROGRAMS

The Mathematical Association of America (MAA) has urged colleges and universities to respond aggressively to the changing needs of their students. In particular, all mathematics departments should prepare students to use mathematics to interpret models and represent mathematical information in several ways, and use different methods to solve problems. Therefore departments should review and adjust their curriculum to reflect the pervasive use of mathematics in each discipline and in the workplace. In courses like the Calculus sequence it is recommended that departments should adopt teaching methods that include laboratory sessions, group activities, and use of the Internet.

Also, in the report *Undergraduate Major in the Mathematical Sciences*, the Committee on the Undergraduate Program in Mathematics (CUPM) of the MAA has made recommendations to guide mathematics departments in designing curricula for their undergraduate students. Among the seven fixed components that form the curricular structure of the mathematical sciences major, there is a four-credit calculus sequence and a differential equations course.

Finally, in 1987 the National Science Foundation (NSF) decided to encourage initiatives to reform the calculus curriculum. Highlights of the NSF reform initiative included:

1. Emphasis on conceptual understanding over rote memorization.
 2. Utilization of technology instead of drilling symbol manipulations by hand.
 3. Emphasis on applications to real-world problems.
-

EVIDENCE OF DEMAND FOR THE NEW FOCUS

The Mathematics Department has discussed with client departments its plans to change the calculus sequence. Dr Mancuso, Chair of the Physics Department, Dr Lakshmanan, Chair of the Computer Science Department, and Dr Zollweg, Chair of the Earth Sciences Department, have all shown strong support for the change and have expressed the desire to see more real-life applications presented in calculus courses.

COMPETITION FROM OTHER ROCHESTER AREA COLLEGES

The mathematics major programs at area colleges all follow the above-mentioned guidelines set by the MAA (12-credit calculus sequence with Differential Equations).

RIT core curriculum includes a 16-credit calculus sequence (Calculus I-IV). Classroom lectures for calculus courses are supplemented with workshops where students work together in small groups to solve real-life problems. The foundation requirements for mathematics majors at the University of Rochester include a 12-credit calculus sequence (Calculus I-III). Nazareth College has a mathematics major program that consists of 40 hours of mathematics including a 12-credit calculus sequence as well as an additional semester of a programming language and two semesters of physics.

If the change were to be implemented, the Mathematics Department at SUNY Brockport would still offer a major program with the lowest number of credits necessary to graduate with a major in mathematics among the fore-mentioned schools.

RESOURCES

No additional resources are needed to implement these tracks.